Class XII Session 2024-25
Subject - Biology
Sample Question Paper - 1

Time Allowed: 3 hours **Maximum Marks: 70**

General Instructions:

1. All questions are compulsory.
2. The question paper has five sections and 33 questions. All questions are compulsory.
3. Section–A has 16 questions of 1 mark each; Section–B has 5 questions of 2 marks each; Section– C has 7 questions of 3 marks each; Section– D has 2 case-based questions of 4 marks each; and Section–E has 3 questions of 5 marks each.
4. There is no overall choice. However, internal choices have been provided in some questions. A student has to attempt only one of the alternatives in such questions.
5. Wherever necessary, neat and properly labeled diagrams should be drawn.

Section A

1. The primary productivity in an ecosystem is expressed as: **[1]**

   a) $gm^{-2}yr$ b) $gm^{-2}yr^{-1}$

   c) K cal $m^{-2}yr^{-1}$ d) K cal m^{-2}

2. Which of the following is the component of oral pills? **[1]**

   a) Antibiotics b) Oxytocin

   c) Progesterone d) Relaxin

3. Just as a person moving from Delhi to Shimla to escape the heat for the duration of hot summer, thousands of migratory birds from Siberia and other extremely cold northern regions move to: **[1]**

   a) Keolado National Park b) Corbett National Park

   c) Meghalaya d) Western Ghat

4. Amniocentesis is the withdrawal of amniotic fluid in: **[1]**

   a) Menopause b) Parturition

   c) Gestation d) Lactation

5. Steroids are used in: **[1]**

   a) All of these b) Birth control

   c) Treatment of hormonal imbalance. d) Treatment of autoimmune diseases.

6. Physical removal of the large and small particle from the sewage through filtration and sedimentation is called: **[1]**

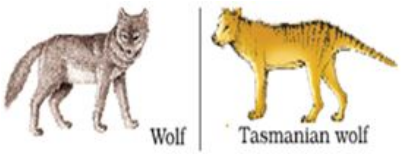
   a) Primary treatment b) Secondary treatment

c) Tertiary treatment
d) Quaternary treatment

7. Genotypic and phenotypic ratio in monohybrid cross remains same in case of: **[1]**

a) Dominant and recessive genes
b) Pseudoallelic genes
c) Intermediate inheritance
d) Sex linked genes

8. Picture shown below is an example of:- **[1]**



a) Convergent evolution of Australian marsupials and placental mammals
b) Divergent evolution of Australian marsupials and placental mammals
c) Homologous organs of both animals
d) Analogous organs of both animals

9. Bacteria and fungi in a forest ecosystem are generally: **[1]**

a) Producers
b) Primary consumers
c) Secondary consumers
d) Decomposers

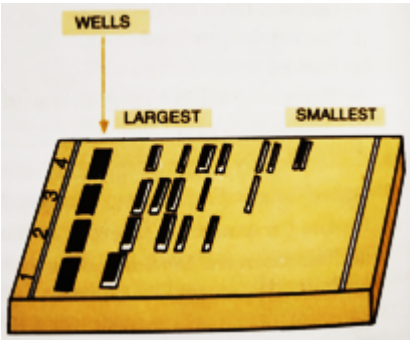
10. In the pedigree analysis, the symbol shown below represent **[1]**

a) Sex unspecified
b) Affected individuals
c) Normal individuals
d) Matting between relatives

11. Which one of the following helps in absorption of phosphorus from soil by plants ? **[1]**

a) Rhizobium
b) Glomus
c) Frankia
d) Anabaena

12. In Gel Electrophoresis, fragments are moved from: **[1]**



1. Anode to Cathode
2. Cathode to Anode
3. Negative to Positive
4. Positive to Negative

a) 1, 4
b) 1, 3
c) 2, 4
d) 2, 3

13. **Assertion (A):** Reproductive health means total well-being in all aspects of reproduction, i.e., physical, emotional, behavioural, and social. **[1]**

Reason (R): A society with people having physically and functionally normal reproductive organs might be called reproductively healthy.

a) Both A and R are true and R is the correct explanation of A.

b) Both A and R are true but R is not the correct explanation of A.

c) A is true but R is false.

d) A is false but R is true.

14. **Assertion:** The primary effluent is passed into large aeration tanks where it is constantly agitated mechanically and the air is pumped into it. **[1]**

Reason: This allows vigorous growth of useful anaerobic microbes into flocs.

a) Assertion and reason both are correct statements and reason is correct explanation for assertion.

b) Assertion and reason both are correct statements but reason is not correct explanation for assertion.

c) Assertion is correct statement but reason is wrong statement.

d) Assertion is wrong statement but reason is correct statement.

15. **Assertion (A):** Vertical distribution of different species occupying different levels in the ecosystem is called stratification. **[1]**

Reason (R): Trees occupy top vertical strata or layer of a forest, herbs, grasses the second and shrubs occupy the bottom layers.

a) Both A and R are true and R is the correct explanation of A.

b) Both A and R are true but R is not the correct explanation of A.

c) A is true but R is false.

d) A is false but R is true.

16. **Assertion (A):** Homo sapiens have evolved from chimpanzee-like ancestors. **[1]**

Reason (R): There is no difference between the two in the amino acid sequence of the protein Cytochrome-C.

a) Both Assertion (A) and Reason (R) are true and Reason (R) is the correct explanation of the Assertion (A).

b) Both Assertion (A) and Reason (R) are true, but Reason (R) is **not** the correct explanation of the Assertion (A).

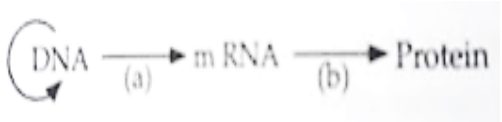
c) Assertion (A) is true, but Reason (R) is false.

d) Assertion (A) is false, but Reason (R) is true.

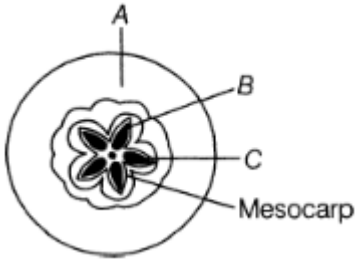
Section B

17. When a foreign DNA is introduced into an organism, how it is maintained in the host and how it is transferred to the progeny of the organism? **[2]**

18. The flow of genetic information is shown below. Name the process of (a) and (b). **[2]**

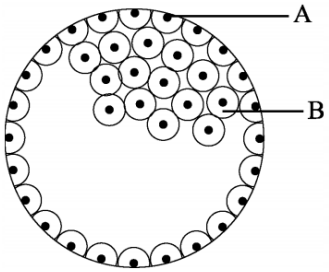


19. i. Given below is a TS of an apple. Identify A, B, and C. **[2]**



ii. Why is an apple categorised as a false fruit?

20. In the given figure, give the name and functions of parts labelled A and B. **[2]**



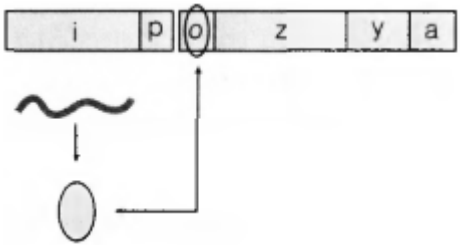
21. Write the various major steps of fermentation. **[2]**

OR

What is LAB? What is its role in human stomach?

Section C

22. Given below is a schematic representation of a lac operon. Answer the following questions: **[3]**



i. Identify i and p.

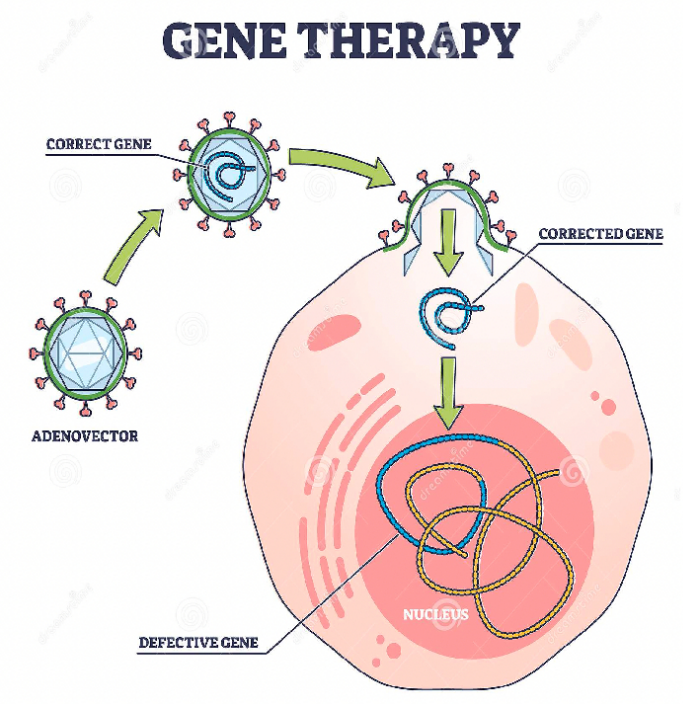
ii. Name the inducer for this operon.

iii. Explain the function of inducer for this operon.

23. List any four symptoms of Down's syndrome. What is the basis of this disorder? **[3]**

24. Name the type of curve that characterizes most populations growing in favourable environment. Define carrying capacity. **[3]**

25. The image below describes the process of Gene Therapy. **[3]**



i. What is gene therapy?

ii. Name the first clinical case in which it was used.

26. Differentiate between in situ and ex situ approaches of conserving biodiversity. **[3]**

OR

Alien species invasion has been a threat to biodiversity. Justify with the help of a suitable example. List any other three causes responsible for such a loss.

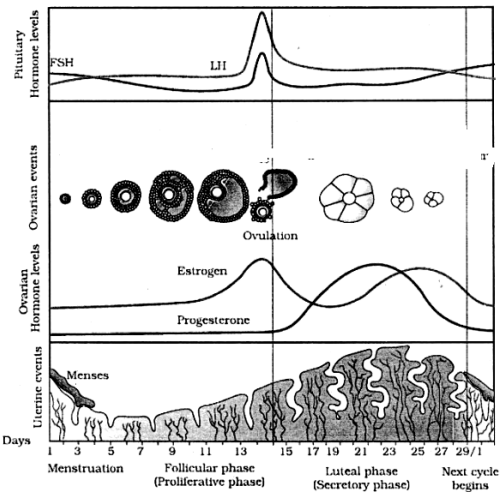
27. How did Louis Pasteur successfully demolish the popular theory of spontaneous generation? What were his conclusions? **[3]**

28. What are the misconceptions about the transmission or acquiring AIDS? **[3]**

Section D

29. **Read the following text carefully and answer the questions that follow:** **[4]**

The reproductive cycle in female primates (e.g. monkeys, apes and human beings) is called the menstrual cycle. In human females, menstruation is repeated at an average interval of about 28/29 days, and the cycle of events starting from one menstruation till the next one is called the menstrual cycle Anita has show Diagrammatic presentation of various events during a menstrual cycle.



i. What role do pituitary gonadotropins play during the follicular and ovulatory phases of the menstrual cycle? (1)

ii. The first half of the menstrual cycle is called the proliferative phase as well as the follicular phase. Give reason. (1)

iii. Why does corpus luteum stay active throughout pregnancy and in the absence of fertilization, is active only for 10-12 days? (2)

OR

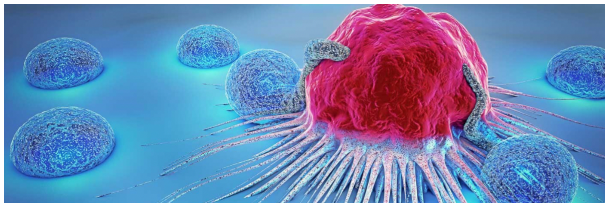
What happens to corpus luteum in human female if the ovum is (2)

a. fertilised,

b. not fertilised?

30. **Read the following text carefully and answer the questions that follow:** **[4]**

Cancer refers to any one of a large number of diseases characterized by the development of abnormal cells that divide uncontrollably and have the ability to infiltrate and destroy normal body tissue. Cancer often has the ability to spread throughout your body. Cancer is the second-leading cause of death in the world.



i. How does a cancerous cell differ from a normal cell? (1)

ii. Benign tumor is less dangerous than malignant tumor. Why? (1)

iii. Describe causes of cancer. (2)

OR

Mention two methods of treatment of the disease. (2)

Section E

31. Trace the development of microspore mother cell in the anther to a mature pollen grain. **[5]**

OR

Draw a labelled sketch of L.S. of pistil showing the progamous type of fertilization.

32. Which property of DNA double helix led Watson and Crick to hypothesise semi-conservative mode of DNA replication? Explain. **[5]**

OR

A single base mutation in a gene may not ‘always’ result in loss or gain of function. Do you think the statement is correct? Defend your answer.

33. i. Why must a cell be made ‘competent’ in biotechnology experiments? How does calcium ion help in doing so? **[5]**

ii. State the role of ‘biolistic gun’ in biotechnology experiments.

OR

i. Explain how to find whether an *E.coli* bacterium has transformed or not when a recombinant DNA bearing ampicillin resistant gene is transferred into it.

ii. What does the ampicillin resistant gene act as in the above case?

Solution

Section A

1. **(b)** $gm^{-2}yr^{-1}$

   Explanation: Primary productivity expressed as $gm^{-2}yr^{-1}$

2. **(c)** Progesterone

   Explanation: Progesterone

3. **(a)** Keolado National Park

   Explanation: Keolado National Park

4. **(c)** Gestation

   Explanation: Gestation

5. **(a)** All of these

   Explanation: All of these

6. **(a)** Primary treatment

   Explanation: Primary treatment of sewage treatment involves the physical removal of large and small particles like paper, plastic, pebble by passing through a screen.

7. **(c)** Intermediate inheritance

   Explanation: Intermediate inheritance

8. **(a)** Convergent evolution of Australian marsupials and placental mammals

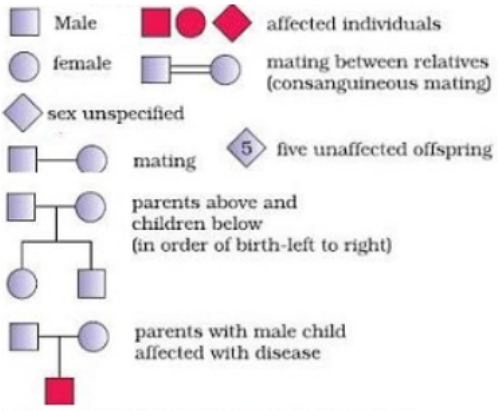
   Explanation: Wolf and Tasmania Wolf are examples of convergent evolution of placental mammals and Australian marsupials. They are evolved differently due to different in climatic and geographic regions.

9. **(d)** Decomposers

   Explanation: Decomposers

10. **(b)** Affected individuals

    Explanation: In pedigree analysis, the symbol shown above represents affected individuals.



11. **(b)** Glomus

    Explanation: Glomus

12. **(d)** 2, 3

Explanation: 2, 3

13. **(b)** Both A and R are true but R is not the correct explanation of A.
Explanation: Both A and R are true but R is not the correct explanation of A.

14. **(c)** Assertion is correct statement but reason is wrong statement.
Explanation: Assertion is correct statement but reason is wrong statement.

15. **(c)** A is true but R is false.
Explanation: A is true but R is false.

16. **(a)** Both Assertion (A) and Reason (R) are true and Reason (R) is the correct explanation of the Assertion (A).
Explanation: Both Assertion (A) and Reason (R) are true and Reason (R) is the correct explanation of the Assertion (A).

Section B

17. Foreign gene is usually ligated to a plasmid vector and introduced in the host. As plasmid replicates and makes multiple copies of itself, so does the foreign gene gets replicated and its copies are made. When the most organism divides, its progeny also receive the plasmid DNA containing the foreign gene.
18. Process 'a' is Transcription and process 'b' is Translation.
19. i. A - Thalamus, B - Seed, C - Endocarp.
ii. In apple, along with the ovary the thalamus also contributes to fruit formation. So, apple is called false fruit.
20. A. = Trophoblast - Gets attached to the endometrium and draws nutritive material secreted by uterine endometrium gland.
B. = Inner cell mass - Differentiates as Embryo.
21. The major steps of fermentation are as follows:
i. Sterilisation of the fermentors/bioreactor and nutrient medium in steam, under pressure.
ii. Inoculation of a selected strain of the yeast.
iii. Recovery of the product.

OR

Lactic Acid Bacteria (LAB) or Lactics constitute a diverse group of microorganisms associated with plants, meat, and dairy. They are used in the manufacture of dairy products such as acidophilus milk, yogurt, buttermilk, and cheeses.
Role of LAB in human stomach:
lactic acid bacteria have a number of well-established benefits. They can improve lactose digestion, play a role in preventing and treating diarrhea and act on the immune system, helping the body to resist and fight infection. It play a very beneficial role in checking disease-causing microbes

Section C

22. i. i-Regulatory gene, p-Promoter gene.
ii. The Inducer is lactose.
iii. **Functions of Lactose**
a. Enters the cell and binds to the repressor and inactivates it.
b. As a result, repressor cannot bind to the operator. This allows RNA polymerase to have access to the promoter and transcription proceeds.
23. Four symptoms of Down's syndrome are:
(a) feeble minded
(b) retarded growth
(c) rounded face and broad forehead
(d) permanently open mouth.
It is an autosomal aneuploidy or 21 trisomy. In this case the egg possesses 24 chromosome instead of 23 and the offspring has 47 chromosomes. (45 + XY in male, 445 + XX in female) instead of 46.
24. - Sigmoid curve
- In nature a given habitat has enough resources to support a maximum possible number of population, beyond which no further growth of the population is possible. This limit is called as natures carrying capacity (K) for that species in that habitat.
25. Gene therapy is a corrective therapy or technique of genetic engineering that is used to replace a faulty or non-functional gene with a normal healthy functional gene.

The first clinical gene therapy was given to a 4-year-old girl with ADA (Adenosine Deaminase) deficiency in 1900. It is caused due to the deletion of the gene coding for ADA, which adversely affects the functioning of the immune system.

26.

In situ conservation	Ex situ conservation
1. It means conservation on site. An endangered species is protected in its natural habitat by maintaining the habitat itself and defending the species from predators and poachers.	1. It means off site conservation. An endangered species is protected by removing it from the threatened habitat and placing it under the care of humans.
2. This approach emphasizes on the protection of total ecosystem.	2. This approach restricts to the protection of genetic resources at population and species level.
3. This approach includes methods of protection like establishing hot spots, national parks, wildlife sanctuaries and biosphere reserves.	3. It is done through live collections of animals and plants in zoos, botanical gardens, seed banks, etc.

OR

Alien species invasion has been a threat to biodiversity. Example of Alien species invasion are as follows:

i. Nile Perch, introduced into lake Victoria (in East Africa), led to the extinction of Cichlid fish (more than 200 species) in the lake
ii. Introduction of African catfish (Clarias gariepinus), for aquaculture, posing threat to indigenous catfish
iii. Introduction of carrot grass (Parthenium) I Lantana I Water hyacinth (Eichhornia), which are invasive weed, that pose threat to native species or any other appropriate example.

Other Causes of biodiversity loss

i. Habitat loss and fragmentation
ii. Over exploitation
iii. Co-extinction

27. He used particular type of flasks in his experiment.
His flasks were pre-sterilised and heat-killed yeast culture was kept in them.
- One flask was kept closed and the other was left open.
- He showed that in the closed pre-sterilised flask, life did not come from the killed yeast, in the other flask that was kept open, life appeared from killed yeast. This dismissed the theory of spontaneous generation.
- He concluded that life can come from pre-existing life.

28. There are many wrong beliefs and misconceptions about the AIDS. AIDS cannot be acquired by the following activities:

i. Insect bites
ii. Crowded transport
iii. Shaking hands
iv. Sharing towels
v. Coughing and sneezing
vi. Kissing and embracing
vii. Sharing utilities and telephone
viii. Swimmingpools and toilets.

Section D

29. i. Gonadotropin-releasing hormone (GnRH) also called gonadotropin-releasing factor (GnRH) is secreted by the hypothalamus of the brain, which stimulates the release of follicle-stimulating hormone (FSH) and luteinizing hormone (LH). FSH stimulates the ovarian follicles to produce estrogens during the proliferative phase. LH stimulates the corpus luteum of the ovary to secrete progesterone.

ii. The first half of the menstrual cycle is called the follicular phase because estrogens secreted by the cells of maturing Graafian follicles control the changes in the secondary sex organs. It is also called the proliferative phase because the growth and proliferation of tissue on the wall of the uterus, vagina take place.

iii. During the luteal phase, the leftover parts of Graafian follicle transform into the corpus luteum. It discharges large quantities of progesterone hormone which is required for the maintenance of the endometrium. The endometrium is important for implantation of the fertilized egg and various other stages of pregnancy. Hence, corpus luteum has a long life in pregnancy. In the absence of fertilization, upholding of the corpus luteum is not required and thus it declines within 10-12 days, which

causes the lining of the endometrium to menstruate and hence the onset of the new menstrual cycle.

OR

i. In case of fertilisation, the corpus luteum continues secreting progesterone which is required for the maintenance of endometrium during pregnancy.

ii. In the absence of fertilisation, the corpus luteum degenerates and gets converted into corpus albicans. Deficiency of progesterone causes disintegration of the endometrium leading to menstruation and thus, a new cycle starts.

30. i. In normal cells, growth and differentiation are highly controlled and regulated (contact inhibition). The cancerous cells have lost the property of contact inhibition, hence continue to divide giving rise to masses of cells (tumors).

ii. The benign tumor remains confined in the organ affected as it is enclosed in a connective tissue sheath and does not enter the metastatic stage.

iii. Cancer may be caused due to carcinogens which are physical (X-rays, gamma rays and UV rays), chemicals (Nicotine, Aflatoxin, Cadmium oxide, Asbestos) and biological (viral oncogenes and proto-oncogenes).

OR

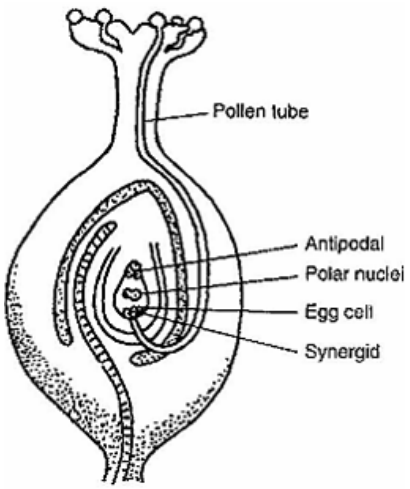
Surgery, radiotherapy, Chemotherapy, immunotherapy by using biological response modifiers like α-interferons.

Section E

31. **Microsporogenesis** comprises the events which lead to the formation of the haploid unicellular microspores. During microsporogenesis, the diploid sporogenous cells differentiate as microsporocytes (pollen mother cells or meiocytes) which divide by meiosis to form four haploid microspores. Each diploid meiocyte gives rise to a tetrad of four haploid microspores and microsporogenesis is complete with the formation of distinct single-celled haploid microspores.

Microgametogenesis comprises events which lead to the progressive development of the unicellular microspores into mature microgametophytes containing the gametes. This phase begins with the expansion of the microspore which is commonly associated with the formation of a single large vacuole. Vacuolation is accompanied by the displacement of the microspore nucleus to an eccentric position against the microspore wall. In this position, the nucleus undergoes first pollen mitosis (pollen mitosis I) which results in the formation of two unequal cells, a large vegetative cell and a small generative cell each containing a haploid nucleus. The generative cell subsequently detaches from the pollen grain wall and is engulfed by the vegetative cell forming a unique 'cell within a cell' structure. The engulfed generative cell divides once more by mitosis (pollen mitosis II) to form the two sperm cells completely enclosed within the vegetative cell cytoplasm either before pollen is shed (tricellular pollen) or within the pollen tube (bicellular pollen).

OR



32. The Watson and Crick observed that the nitrogenous bases form complementary pair between the two polynucleotide chains of DNA. Based on the X-ray diffraction data, they proposed that DNA consisted of a double helix with two chains having sugar phosphate on the outside and nitrogen bases on the inner side. Further, they proposed that the two chains are antiparallel with 5'-3' orientation of the other. The two chains are twisted helically just as a rope ladder with rigid steps twisted into a spiral. This property of double helix model of DNA led them to hypothesize semi-conservative mode of DNA replication, where the two strands separate and act as a template for the synthesis of new complementary strand.

OR

A single base mutation in a gene may not always result in loss or gain of function. We know that a codon is composed of three nucleotides. In simple terms, a codon can be taken as a word that is composed of 3 letters. For making any meaningful sentence we need a complete word. The addition or deletion of a single letter may not result in a meaningful word. Hence, in most of cases,

there is a need for mutation in three bases to affect loss or gain of function. This can be illustrated by the following example of a sentence being altered:

RAM HAS RED CAP

RAM HAS BRE DCA P

RAM HAS BIR EDC AP

RAM HAS BIG RED CAP

It is clear that a meaningful sentence is made only when at least three letters are inserted in this sequence.

33. i. Since, DNA molecules are hydrophilic, they cannot pass through cell membranes. For recombinant DNA to be integrated into the vector or host genome, it is necessary for the DNA to be inserted in the cell. Therefore, making the host cells competent is necessary for biotechnology experiments.

The two ways by which cells can be made competent to take up DNA are:

a. **Chemical action** -The host cell is treated with a specific concentration of divalent cation, i.e. calcium which increases the pore size in the cell membrane. DNA is then incubated with the treated bacterial cell at 42°C, thereby increasing the efficiency of DNA entering through pores in the cell wall.

b. **Heat shock treatment-** Incubating the cells with recombinant DNA on ice, followed by a brief treatment of heat at 42°C and again putting them back on ice.

ii. Biolistic guns or gene guns are used to bombarded rDNA loaded on gold or tungsten particles with high velocity. In this way, the rDNA is delivered to the desired host cells.

OR

i. When an *E.coli* bacterium is transformed with a recombinant DNA bearing ampicillin-resistant gene in its plasmid, the recombinant plasmid will lose tetracycline resistance due to the insertion of foreign DNA but can still be selected out from non-recombinant ones by plating the transformants on ampicillin containing a medium. The transformants growing on ampicillin containing medium are then transferred to a medium containing tetracycline. The recombinants will grow on ampicillin containing medium but not one that containing tetracycline. But non-recombinant will grow on the medium containing both the antibiotics.

ii. In this case, one antibiotic gene helps in selecting the transformants whereas the other antibiotic resistance gene gets inactivated due to the insertion of alien DNA and helps in the selection of recombinants. Ampicillin resistant gene in the above case helps in selecting the transformants and act as a selectable marker.